

What is claimed is:

1. A method for firing a primer or propellant charge, comprising:

providing a plasma torch generator comprising a cathode, an anode, a gas passage for allowing pressurized gas to flow between the anode and cathode, and a power source electrically coupling the anode and cathode;

generating an arc between the anode and cathode;

providing pressurized gas to the arc via the gas passage; and

applying a current between the anode and cathode to generate a plasma torch, wherein the plasma torch generator is positioned so that a plasma torch is capable of contacting a primer, cartridge, or propellant charge.
2. The method of Claim 1, wherein the gas is provided in a continuous flow.
3. The method of Claim 1, wherein the gas is provided as a pulse of gas.
4. The method of Claim 1, wherein an approximately 20 kV voltage is used to generate an arc.
5. The method of Claim 1, wherein a voltage between about 3 kV and about 20 kV is used to generate an arc.
6. The method of Claim 4, wherein the duration of the current is between about 5 millisecc and about 30 millisecc.
7. The method of Claim 4, wherein the duration of the current is between about 5 millisecc and about 10 millisecc.
8. The method of Claim 4, wherein the gas is provided during the same time period that the current is applied.
9. The method of Claim 1, wherein the power source comprises a first generator for generating an arc using a voltage pulse and a second generator for applying the current.

10. The method of Claim 1, wherein more than one plasma torch generator is provided.
11. The method of Claim 4, wherein more than one plasma torch generator is provided.
12. The method of Claim 1, wherein the rate of firing of the plasma torch is controlled by the current applied from the power source.
13. The method of Claim 1, wherein the current used is about 15 amps.
14. A plasma firing device for use with a firearm comprising:
 - a vortex cathode;
 - an anode;
 - a gas passage for pressurized gas to flow between the cathode and the anode;
 - a gas supply for supplying gas to the gas passage; and
 - a power source electrically connected to the cathode and the anode for generating a plasma torch,wherein a plasma torch generated between the cathode and anode is capable of contacting a cartridge, primer, or propellant charge loaded into the firearm.
15. The device of Claim 10, wherein the plasma torch fires the firearm by detonating a mechanical primer.
16. The device of Claim 10, wherein the plasma torch fires the firearm by detonating a propellant charge.
17. The device of Claim 10, wherein the power source comprises two generators.
18. The device of Claim 10, wherein a first generator is capable of providing a voltage to cause an arc to form between the anode and cathode.
19. The device of Claim 10, wherein a second generator is capable of providing a current between the anode and the cathode to generate a plasma torch.

20. The device of claim Claim 10, wherein the power source is capable of providing a current of between about 5 to about 30 milliseconds in duration.
21. The device of Claim 10, wherein the gas supply is capable of providing pressurized gas at about 3 to about 10 bar.
22. A firearm comprising:

a chamber for accommodating a projectile and a propellant charge;

a breech operably connected to the chamber, wherein the breech prevents the escape of gases from the detonation of the propellant charge when closed; and

a plasma firing device connected to the breech for generating a plasma torch to detonate the propellant charge, the plasma firing device comprising a cathode, an anode, a gas passage between the cathode and the anode, a gas supply for supplying gas via the gas passage, and a power supply electrically connected to the cathode and the anode for generating a plasma torch, wherein the plasma torch generated is capable of contacting a surface of the propellant charge.
23. The firearm of Claim 22, wherein the plasma firing device is integral to the breech.
24. The firearm of Claim 22, wherein at least a portion of the plasma firing device is external to the breech.
25. The firearm of Claim 22, wherein the power supply comprises a first generator electrically connected to the cathode and the anode for generating an arc across the anode and cathode, and a second generator electrically connected to the cathode and the anode for generating a plasma torch.
26. The firearm of Claim 22, further comprising a control switch or trigger, operably connected to the power supply, wherein the plasma torch is generated by activating the power supply through the control switch or trigger.
27. The firearm of Claim 22, wherein the activation of the power supply through the control switch or trigger results in the generation of two more plasma torches over a period of time.

28. A firearm capable of firing one or more cartridges, the firearm comprising:
- a chamber for accommodating a cartridge;
- a bolt head configured to alternate between a forward position and a rearward position in response to the firing of one or more cartridges; and
- a plasma firing device positioned in the bolt head for generating a plasma torch to detonate the primer of a chambered cartridge, the plasma firing device comprising a cathode, an anode, a gas passage between the cathode and the anode, a gas supply for supplying pressurized gas to the gas passage, and a power supply electrically connected to the cathode and the anode for generating a plasma torch to fire the firearm.
29. The firearm of Claim 28, wherein the plasma firing device is integral to the bolt head.
30. The firearm of Claim 28, wherein at least a portion of the plasma firing device is external to the bolt head.
31. The firearm of Claim 28, wherein the power supply comprises a first generator electrically connected to the cathode and the anode for generating an arc across the gas passage and comprises a second generator electrically connected to the cathode and the anode for generating a plasma torch to fire the firearm.
32. The firearm of Claim 28, wherein the plasma torch is generated for a short duration by synchronizing a short pulse of gas from the gas supply with a short pulse of current from the power supply.
33. The firearm of Claim 28, wherein the plasma torch is capable of being generated for a short duration by applying a continuous flow of gas from the gas supply and a short pulse of current from the power supply.
34. The firearm of Claim 28, wherein the firing rate of the one or more cartridges is controlled by repeatedly generating a plasma torch for a short duration.
35. The firearm of Claim 34, wherein the plasma torch is generated once for each operator firing input to fire the firearm in a semiautomatic mode.

36. The firearm of Claim 34, wherein the plasma torch is generated a preset number of times for each operator firing input to fire the firearm in burst mode.
37. The firearm of Claim 36, wherein the preset number of times can be varied by an operator of the firearm.
38. The firearm of Claim 34, wherein each operator firing input causes the plasma torch to be generated at a predetermined time interval until an operator input to cease firing is received.
39. The firearm of Claim 38, wherein the predetermined time interval can be varied by an operator of the firearm, thereby allowing operator adjustment of the automatic rate of fire.